EASTERN BADIA ARCHAEOLOGICAL PROJECT (EBAP)

Yorke M. Rowan

The Eastern Badia Archaeological Project includes both survey and excavation in an area of the northeastern badia, or Black Desert, of Jordan that transects a variety of ecological zones along the edge of the basaltic areas. Our objectives are to record and analyze architecture, landscape, artifacts, and paleoclimatic information in order to achieve a fresh perspective on the diachronic use and occupation of the understudied region. Our efforts focus on two areas: Wisad Pools and Wadi al-Qattafi. During the 2016 campaign we concentrated on two primary goals: the completion of excavation of a Late Neolithic structure (South Slope 1, SS1), which was sectioned and partially excavated in 2015, and detailed aerial mapping of the structures and mesas along Wadi al-Qattafi. Despite some setbacks, both aims were achieved over the course of two seasons of fieldwork in 2016.

Figure 1. Mesas along Wadi al-Qattafi with Maitland's Mesa (M4) in foreground, with structures on slopes and on top; looking north (photo: A. C. Hill)

Our first season was a two-week period dedicated to the aerial survey using Unpiloted Aerial Vehicles (UAVs), or drones. Our goal was to map the large number of structures, many of them probably dating to the Late Neolithic (ca. 6500–5000 BC) period, that are visible on the landscape clustered on the slopes and atop the basalt mesas along the Wadi al-Qattafi (fig. 1). UAV survey is particularly useful for mapping prehistoric structures that are too small (typically a few meters in diameter) for accurate identification using satellite data, and especially useful in an environment where structures are visible on the surface, with few obstructions impeding flights. By flying lower than manned airplanes and satellites, cameras on UAVs can be used to produce geo-referenced orthophotographs — undistorted, spatially accurate and geo-referenced images — and Digital Elevation Models (DEMs), more quickly and efficiently.

Figure 2. Fixed wing drone immediately after crash (photo: Y. Rowan)

Figure 3. Mesa 7, orthophotograph with structures outlined (orthophoto: A. C. Hill)

Since 2012 we have been using drones constructed and flown by Oriental Institute research associate Austin "Chad" Hill in order to record features in the Black Desert as part of EBAP. They do bring challenges, of course, and the remote location of Wadi al-Qattafi exacerbates those difficulties. In a remote, dusty and rocky desert environment, conditions are harsh for aircraft, cameras, and on-board electronics. The possibility of crashes or necessity to repair equipment requires many redundancies and spare parts, and a generator is necessary to constantly recharge batteries for computers, drones, flight controllers, and other electronics. Although we had two fixed wing drones (the most efficient system) and one multi-rotor drone, one fixed wing drone was held at the airport. Unfortunately, in the first of our two survey trips we had a catastrophic failure of the fixed wing aircraft (fig. 2), and with our backup system unavailable, we continued with the multi-rotor. Incredibly, Hill restored the fragments of the broken fixed wing and it flew again for our second survey trip during the regular, excavation season.

During the two data collection seasons we recorded approximately 20,000 images from the drones, and fixed both the wing plane and the multi-rotor DJI Phantom. Processing and analysis of this data is ongoing, but examples of orthophotographs demonstrate the utility and high quality data produced via the drone imagery collection. For example, Figure 3 shows an orthophotograph of Mesa 7, on which we highlight the various structures dotting the slopes and on top of the mesa.

In addition to documenting the hundreds of smaller structures, we identified numerous so-called "desert kites," the animal traps created by low walls leading to enclosures. One of the most interesting anthropogenic features around Wadi al Qattafi, and indeed, the desert in general, is the phenomena of the desert kites. These long, low rock lines (calling them "walls" is perhaps an exaggeration!), which sometimes stretch for kilometers, are often barely visible at ground level, blending in with the surrounding rocky landscape. These lead to enclosures where herd animals were trapped and killed. Difficult to interpret from the ground, an elevated perspective makes them easily recognizable, and local topography was frequently employed to enhance the functional effectiveness to trap animals such as gazelle, and perhaps onager (wild donkey). The ability to record kites with low elevation drone imagery and produce three dimensional GIS data allowed us to recognize previously unknown kites at Qattafi, and to recognize the topographic features incorporated into the construction of the kites. For example, a kite between Mesas 11 and 12 utilizes the bowl formed by rim of the mesas, with the walls running along the side of the mesas' slopes, leading the animals into the bowl below the mesas (fig. 4). Another variation is found at "Tell A" (M2), where three kites were discovered built along, and on top of the mesa (fig. 5). On the northern and southern extent of the mesa, kite walls lead to the enclosures built tightly into the steep sloping sides. The largest kite, however, has guiding walls that lead to the top of the mesa from the east. Small cells are built along the walls, presumably where hunters hid (although these may be deeper pits that trapped animals). The very large enclosure also has cells, typical of most kites, and runs along the western edge of the mesa.

To our surprise, previously unrecognized kites were discovered during the aerial survey. Although these are only preliminary results that require ground truthing, the aerial survey demonstrates the efficacy of using drones for the collection of high resolution data at minimal cost. In our initial article about this research (Hill and Rowan 2017), we suggest that many of the kites in the Wadi al-Qattafi survey area connected through meandering walls and the mesas themselves. By using the steep mesas as natural obstacles, and filling in between them with walls and kites, there seems to be a connected system similar to other documented kite chains in the Black Desert (e.g., Helms and Betts 1987; Kempe and al-Malabeh 2013; Hammer and Lauricella 2017).

South Slope Excavations, Mesa 7

After the excavation of the Neolithic structure on the southern slope of Maitland's Mesa revealed a domestic building (rather than a burial structure), we realized that many more collapsed structures could be found along Wadi al-Qattafi. One of the highest densities of construction was on the slopes and at the base of M-7, approximately one kilometer north of Maitland's Mesa, where approximately 300 buildings cluster on the slopes (fig. 6). In addition to the bewildering number of structures, some architectural variability was apparent, with buildings erected using corbeling techniques and others characterized by walls of vertical basalt slabs. Of particular interest was one structure that appeared to include both construction techniques. This building (SS-1, for "South Slope-1") was selected for excavation due to its unique structural character as well as its potential for demonstrating architectural renovation over time.

As noted in the *Annual Report* (2015–2016), the structure on the slope of Mesa 7 was sectioned in half. The northwestern half of the circular structure was excavated during the

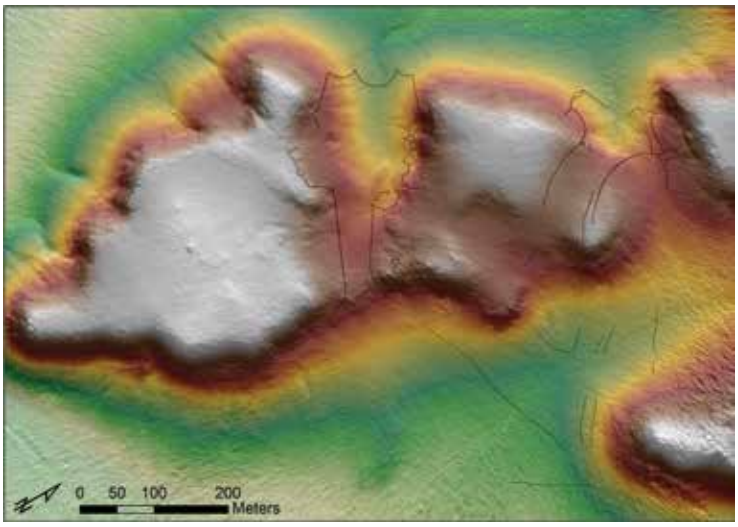

Figure 4 (top). Kite between M11 and M12, DEM (figure: A. C. Hill)

Figure 5 (middle). Tell A (M2) with three kites outlined on orthophotograph (figure: A. C. Hill)

Figure 6 (bottom). Photo of M7, with SS-1 indicated (photo: A. C. Hill)

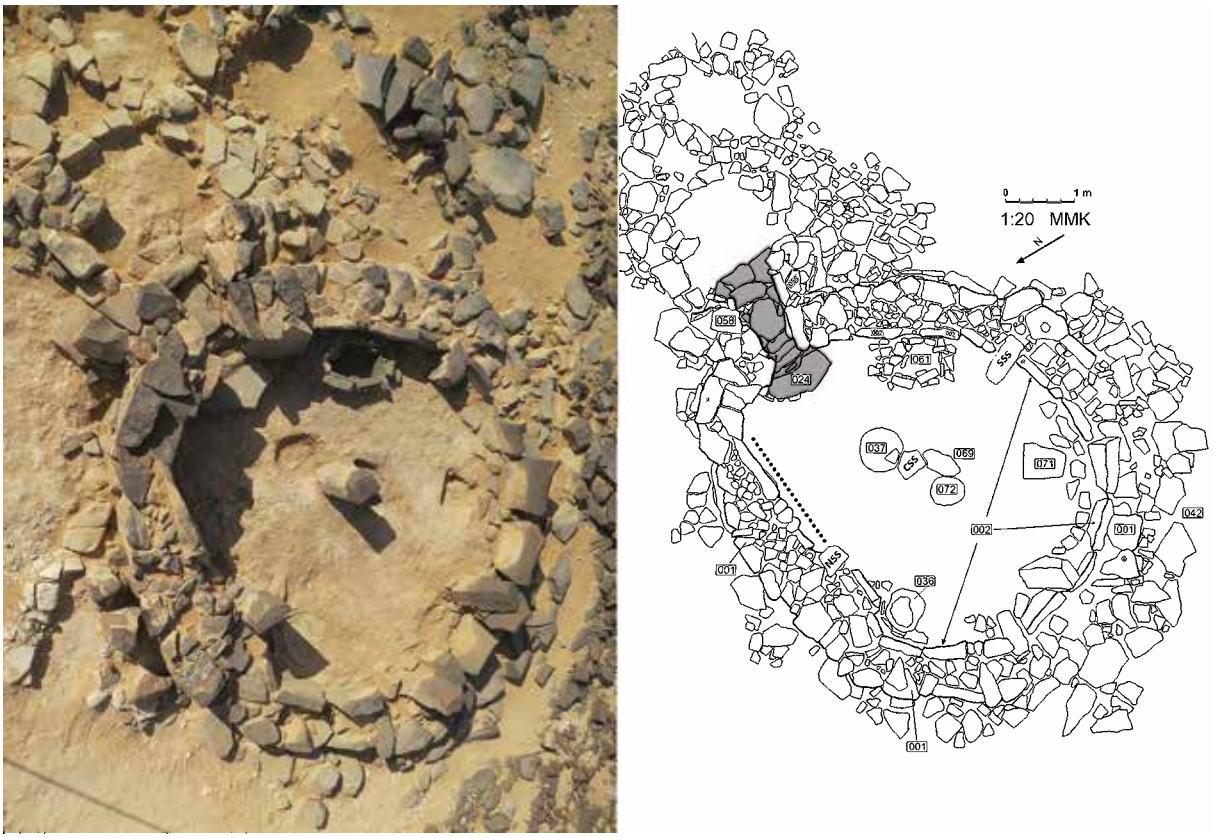

Figure 7. Orthophoto of SS-1 with line drawing (photo: Y. Rowan; drawing: M. Kersel)

Figure 8. Entrance to SS-1 (photo: Y. Rowan)

Figure 9. Hearth (061) (photo: Y. Rowan)

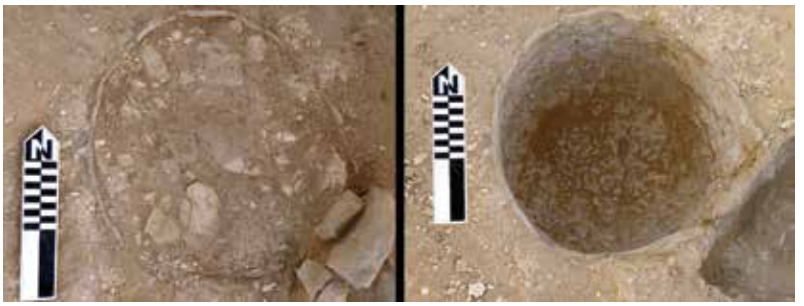

Figure 10. Plaster lined pit, before and after excavation (photo: Y. Rowan)

2015 season, and the remainder was completed during the 2016 season. Over these two seasons the roughly circular building was found to be similar in size to SS-11, excavated on the southern slope of Maitland's Mesa (see *Annual Report* 2012–2013, pp. 32–39). Externally, the building was approximately 6.3 × 5.4 m, with interior dimensions of 4.0 × 4.6 m. Although we initially believed the building was corbeled in similar fashion to SS-11 at Maitlands, based on our findings we now doubt that this was the case. The southwestern half of the interior may have been open to the elements.

With the completed excavation, we have a better sense of the construction of this building (fig. 7), although questions remain. After leveling an area on the relatively steep slope by carving into the soft limestone bedrock, a thick wall (up to 1 m in places) was constructed, sometimes in vertical layers. In similar fashion to SS-11, extremely large blocks were placed on the upslope, exterior side, perhaps to protect the structure from slope wash. The wall was not built in a consistent manner for the entire circumference, instead using both upright and horizontally laid slabs. Supporting pillars of basalt, including one in the center of the building (CSS) and others built into the walls (SSS ?, NSS ?, fig. 7), must have supported some type of roof. Yet, these pillars are set low and establish a height just over 1 m. This seems an unlikely low ceiling, particularly given the other features of the interior space.

During our most recent excavations, an entrance to the building was uncovered, but this is an extremely narrow space (fig. 8) that was possibly created later during a reconfiguration. Just inside this entrance a well-built hearth (061) was constructed along the interior wall and should provide additional radiocarbon dates (fig. 9). Slightly south of the large shallow plaster-lined basin (036) uncovered during the 2015 excavations, a plaster-lined pit (072) was built into the floor near the central pillar (fig. 10). We also focused our excavations on the exterior of the building, where some paving seemed likely to have existed. In addition, substantial construction on the northeastern building exterior (058) seemed built in order to reinforce and protect the opening. To the south of this area, another large ash feature was also a built hearth.

Figure 11. Incised conical limestone item (photo: G. Rollefson)

A greater number of finds were recovered from this building compared with the assemblage excavated at SS-11, perhaps suggesting a greater intensity of use and duration. Beads of carnelian, Dabba marble (a local stone), shell (Conus, cowrie, dentalium), other unidentified rock types, stone bracelet fragments, a shaft straightener, and an incised conical limestone fragment (fig. 11) represent a much

richer material culture assemblage than at the SS-11 structure. Ground stone items were also more numerous, primarily consisting of grinding slabs and smaller handstone or pestles. Only two arrowheads were found during excavations at SS-11, whereas at SS-1, nearly seventy arrowheads were recovered. The diverse array of arrowheads includes Nizzanim, Haparsa, Herzliya, Byblos, and "Badia" points (fig. 12). Only two transverse arrowheads were found, a striking contrast to the hundreds of transverse arrowheads recovered from the roughly contemporaneous but much larger structure W-80 at Wisad Pools (see *Annual Report* 2013–2014, pp. 37–46). The much higher frequency of transverse arrowheads at Wisad Pools probably reflects the much greater emphasis on hunting of small game and fowl in contrast to the Wadi al-Qattafi sites where there is less water to attract animals. Likewise, the absence of large heavier Badia points at Wisad Pools seems significant.

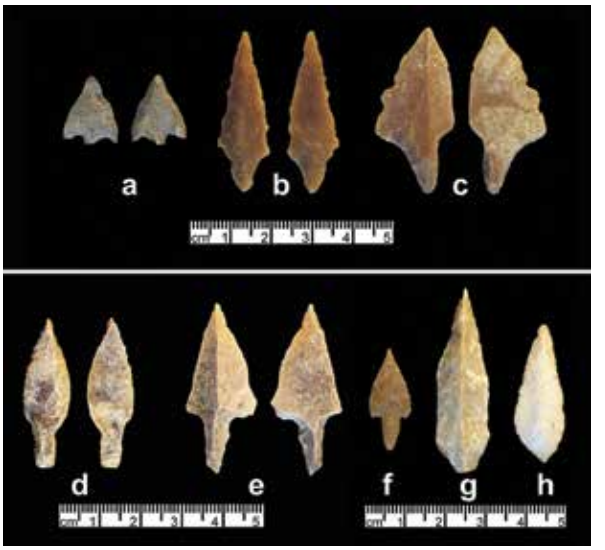

Figure 12. Arrowheads (photo: G. Rollefson)

Figure 13. Drills: on burin spalls (upper row); on bladelets (lower row) (photo: G. Rollefson)

Analysis of the flint tools and debitage is ongoing, but some observations are possible. Many other tool types are also represented in the chipped stone assemblage, including burins, scrapers, notches, denticulates, borers, and drills, and a variety of knives. Particularly notable is the high relative frequency of burins in the assemblage, which constitute approximately one-quarter of the formal tools. Also significant are the substantial numbers of borers and drills, the latter made from both bladelets and burin spalls (fig. 13), particularly well-suited for manufacturing beads.

Radiocarbon dates indicate that SS-1 is earlier than SS-11 at Maitland's Mesa. Dates based on four samples from within the structure of SS-1 range from approximately 6490–6236 cal BC, roughly a millennium earlier than SS-11. This overlaps with the dates from structures at Wisad Pools and underscores that any differences in assemblages probably reflect functional and environmental conditions rather than chronological differences. These dates also indicate a long lifespan for these sites in the eastern Badia.

Although small and incremental, our increasing quantity of archaeological and environmental data from the study area is dramatically altering our understanding of the Black

Desert, particularly during late prehistory. The significant investment in building substantial structures in both areas attests to longer stays in the desert than we would expect of pastoralists, and the evidence for hunting underscores the different environmental conditions supported by the plant remains. Rather than the virtually empty desert we see today, small hamlets of extended families capable of organizing some large building projects apparently spent a large part of the year in the region. Many questions remain, however, including whether the Wadi al-Qattafi community and those at Wisad Pools are a single community of hunter-herders stretched out across the badia, or whether different groups of migrant pastoralists from the west can be distinguished from those living farther east. All these lingering research questions demonstrate the necessity of further investigations in this important and neglected desert area.

References

Hammer, Emily, and Anthony Lauricella

2017 "Historical Imagery of Desert Kites in Eastern Jordan. *Near Eastern Archaeology* 80.2: 10–19.

Helms, Svend, and Alison Betts

1987 "The Desert 'Kites' of the Badiyat Esh-Sham and North Arabia." *Paléorient* 13.1: 41–67.

Hill, Austin C., and Yorke M. Rowan

2017 "Droning on in the Badia: UAVs and Site Documentation at Wadi al-Qattafi." *Near Eastern Archaeology* 80.2: 50–59.

Kempe, Stephan, and Ahmad Al-Malabeh

2013 "Desert Kites in Jordan and Saudi Arabia: Structure, Statistics and Function, a Google Earth Study." *Quaternary International* 297: 126–46.